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## Review of DOE's Nuclear Energy Research and Development Program (2008) Board on Energy and Environmental Systems (BEES)

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### REVIEW OF DOE'S NUCLEAR ENERGY RESEARCH AND DEVELOPMENT PROGRAM

Committee on Review of DOE's Nuclear Energy Research and Development Program

Board on Energy and Environmental Systems

Division on Engineering and Physical Sciences

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

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Review of Doe's Nuclear Energy Research and Development Program Preface In January 2005, the FY 2006 President's Budget Request asked for funds to be set aside for a review by the National Academy of Sciences of the nuclear energy research programs and budget at the U.S. Department of Energy (DOE). Following passage of the FY 2006 congressional budget, the National Research Council (NRC) developed a statement of task (see Appendix F) for a "comprehensive, independent evaluation of the goals and plans of the office of Nuclear Energy (NE) at DOE, and processes for establishing program priorities and oversight (including the method for determining the relative allocation of budgetary resources)." The NRC established a committee to carry out the project, but the committee did not meet until August 24, 2006—over 18 months after the request for funds for the study. During that interim period, DOE's nuclear research program changed significantly with the emergence in early 2006 of a major programmatic initiative—the Global Nuclear Energy Partnership (GNEP). If executed as envisioned by its advocates, the GNEP program would result in the construction of commercial-scale facilities for spent fuel reprocessing and disposal by consuming the resultant plutonium and minor actinides together in advanced burner reactors, thereby reducing the radioactive burden on the waste repository. The budgetary implications of this new program were very substantial; if appropriated, the President's Budget Request for FY 2008 would more than double the Office of Nuclear Energy research and development budget from its FY 2006 appropriations level, mostly as a result of the GNEP program. These developments created two issues for the committee. First, the program for which the statement of task had been prepared changed significantly between the writing of the statement of task and the start of the committee's work. Second, the dominant new program, GNEP, lacked the technical documentation, program plans, and program management organization that would ordinarily form the basis for an evaluation of program content and budget priorities. Despite these difficulties, the committee decided that the issues surrounding the design and technical approach of the GNEP program were sufficiently controversial that they could not be ignored in its review. I commend my colleagues on the committee for taking this stand and thank them for being willing to deal with the resulting frustrations of crafting a balanced evaluation of GNEP in the absence of information that would normally be available. I wish to thank all of the committee members for the exceptional knowledge and patience they brought to this assignment. Our work probably required more of these qualities than any of us expected when we set out on this task. The support we received from the NRC staff certainly met the high standards I have come to expect of them. My appreciation especially goes to Martin Offutt, Matt Bowen, and Jim Zuchetto. Panola Golson once again made the administrative support both effective and unobtrusive. Robert W. Fri Chair Committee on Review of DOE's Nuclear Energy Research and Development Program

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Review of Doe's Nuclear Energy Research and Development Program Acknowledgments The Committee on Review of the DOE's Nuclear Energy Research and Development Program is grateful to the many individuals who contributed their time and effort to the National Academies' National Research Council (NRC) study. The presentations at committee meetings provided valuable information and insights. The committee thanks the following individuals who provided briefings: Jim Bresee, U.S. Department of Energy (DOE), Richard Chandler, Office of Management and Budget, George Davis, Westinghouse, John Deutch, Massachusetts Institute of Technology, Marvin Fertel, Nuclear Energy Institute, Timothy A. Frazier, DOE, Ray Ganthner, AREVA, Eugene Grecheck, Dominion Energy, Inc., Susan L. Harlow, DOE, Dave Hill, Idaho National Laboratory, R. Shane Johnson, DOE, Rick Kingston, GE, Dale Klein, U.S. Nuclear Regulatory Commission, Marilyn Kray, Exelon/NuStart, Paul Lisowski, DOE, Owen Lowe, DOE, Albert Machiels, Electric Power Research Institute (EPRI), Kathryn McCarthy, Idaho National Laboratory, John C. Miller, DOE, Tom Miller, DOE, Dave Modeen, EPRI, Jim Reinsch, Bechtel, Carl Sink, DOE, Rebecca Smith-Kevern, DOE, Dennis Spurgeon, DOE, John Stamos, DOE, Joe Turnage, Constellation Energy/UniStar, and Gary Vine, EPRI. This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of the independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report: John Ahearne, NAE, Sigma Xi, Jan Beyea, Consulting in the Public Interest, Philip R. Clark, NAE, GPU Nuclear Corporation (retired), E. Linn Draper, Jr., NAE, American Electric Power, Inc. (emeritus), Steve Fetter, University of Maryland, Richard Garwin, NAS, NAE, IOM, Council on Foreign Relations, Richard Meserve, NAE, Carnegie Institution, Kenneth Peddicord, The Texas A&M University System, Neil Siegel, NAE, Northrop Grumman Mission Systems, and Raymond G. Wymer, Oak Ridge National Laboratory (retired). Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Chris Whipple of ENVIRON International Corporation. Appointed by the National Research Council, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

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